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WATER RESOURCES POLICY REVIEW

BACKGROUND PAPER ON WATER RESOURCE DATA

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INTRODUCTION

Increasing demands upon Montana's water resources have focused attention on the fact that the continued well-being of this state is heavily dependent upon its water resource. Care must therefore be taken to assure this resource is properly managed and wisely used, and that adequate supplies of good quality water are available in the future. The decision-making needed to assure wise planning and management is necessarily reliant on adequate, reliable information. Such information must be readily available and regularly updated in order to monitor the influence of past decisions on the supply and quality of Montana's water. In the long-run, the ready availability of substantive water resource data can greatly improve the efficiency and cost-effectiveness of water resource decision-making, and reduce the social costs attributed to decisions based on inadequate information.

The availability of comprehensive and reliable water resource information is not a luxury. Rather, it constitutes a necessary and wise investment in the future of Montana. The Montana Legislature acknowledged this imperative in passing the state's Water Use Act. In that law, the Department of Natural Resources and Conservation was mandated to gather information which pertains to our water resources, and to prepare a continuing and comprehensive inventory of the state's water resources (See Section 85-1-203(1) MCA 1979).

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STATEMENT OF THE PROBLEM

A reliable and comprehensive data base constitutes a necessary precursor to proper management of Montana's water resource. In spite of this fact, there are problems with the data upon which needed decisions must be based. The nature and consequence of these problems are generally elucidated in the following statement from the Second National Water Assessment by the U.S. Water Resources Council (1978):

> There are wide ranges in the basic data and in the derivations of estimates for water use and availability in the Missouri Region. These occur primarily because of a lack of firm data on irigated areas, on unit requirements for withdrawals, and on net depletions to surface-and-ground water sources. Together with differences in assumptions and procedures, these ranges make impossible any consensus on water supplies used historically or currently, those presently available, and the probable uses and streamflow or groundwater depletions under projected increased usage.

The problems inherent with the water resource data for Montana are not unlike those described by the Water Resources Council and may be attributed to the fact that information has been collected in a piecemeal fashion over the years. This is due to the adopting of a variety of water resource managment programs, each designed to meet specific needs or objectives. Water resource data collected under these various efforts are essential to

water planning and management; however, their reliability is limited because of collection and dissemination deficiencies. Causes of the problems are discussed below and have been partitioned into three general areas: data collection, data storage and data retrieval.

1. Data Collection

Data needed to make today's complex water resource decisions are often found to be inadequate. For example, each day the Department must make decisions on applications for permits to withdraw groundwater. In addition, there is a regular need to deal with groundwater problems which are not unlike other areas of this nation (i.e. "mining" of aquifers, uranium _in situ_ mining, or development of projects requiring large withdrawals of groundwater). Frequently Department action is severely hampered by the lack of adequate information on this significant water source. The Montana Bureau of Mines and Geology is taking important steps to overcome this problem and, along with a variety of groundwater research projects, has initiated a computerized system for inventorying the quantity and quality of Montana's groundwater resources. Although this is a critical effort, only ten percent of the state has been adequately inventoried due to problems with inadequate financial support.

Another data collection problem is that critical water data are outdated. A notable example is the Department's irrigated land survey for quantitatively delineating irrigated lands and the distribution methods used.

This information is critical to effective water resource planning since irrigation accounts for over 90 percent of the water use in this state. The data also bear heavily on water right decisions and the work of the Reserved Water Rights Compact Commission, the group charged with negotiating water compacts between the Indian tribes in Montana, the Federal Government and this state. Although this information is important, it was collected as part of the Montana Water Resources Survey Program, an effort spanning nearly 25 years (1946 to 1970), and essentially has not been updated since then.

Data collection is characteristically done on a piecemeal basis. Information is obtained only when it is needed and often is limited to the scope of a single project. Broad and continuing information gathering programs are not common and occur only as funds become available. At times, collected data and subsequent analyses are lost or misplaced, and must therefore be regenerated for use in other projects.

Many new approaches to collecting resource data are being developed which have greater cost-effectiveness, accuracy and speed. Notable among them are the remote sensing systems involving earth satellites (e.g. Landsat), "real time" systems and scanners. Often, essential data are not being collected because the capabilities of these technologies have not been examined and utilized.

Data collection efforts are usually intiated by individual agencies as part of single-purpose projects. At times, such endeavors do not reflect the

needs and interests of other water resource management agencies or groups, and, at times, are initiated without knowing whether needed data are presently available. As a result of this circumstance, water data are commonly not standardized with respect to measurement techniques and units of measure (e.g. collection frequencies, measurement techniques, scale). An example of this situation may be found in the streamflow data collected by this Department, the Department of Fish, Wildlife and Parks, the Department of Health and Environmental Sciences, the U.S. Forest Service, the U.S.Geological Survey and others. These hydrography programs serve various purposes and the resultant data are therefore sufficiently different that ready information exchange is generally difficult.

There is no formal and effective means to define priority data needs for the state, identify areas of incompleteness or assign data collection responsibilities.

2. Data Storage

Considerable important information is stored or filed within individual agencies and virtually unavailable for general use. Data are often stored haphazardly with no file and record definitions. Important and widely useful information is frequently not available in an automated format, even though a computer capability exists for data storage and handling.

3. Data Retrieval

Important and available data are hard to obtain since they are dispersed among many agencies and few directories exist. Further, a central catalogue of available water resource data has not been compiled. As a result, researchers, managers and planners, seeking data for special studies, have no recourse except to repeated, time-consuming searches among a large number of possible sources.

Standardized formats for storing collected information are lacking. Consequently, even though data are in a computer format ("hard copy"), it is necessary to make large coding changes in order to perform automated analyses.

OPTIONS FOR RESOLVING PROBLEM

The status of water resource information for Montana can be linked to fundamental problems which are attributable to fragmentation and lack of coordination. Overcoming these problems is not an insurmountable task and there are several means to a resolution. In varying degrees, each option has a potential to improve the present situation. Before examining these various courses of action, consideration should first be given to the types of activity which might comprise a more-nearly ideal solution. These activities may be used to measure the general efficacy of the potential options and include: the development of a coordination mechanism, an evaluation of

presently available data and future needs, and the devising of an effective system for collecting storing, and retrieving information. The following discussion presents further detail on each of these general activities:

1. Coordination

This activity would focus on the development of a mechanism for encouraging and coordinating a statewide effort to acquire needed water resource data. Any such scheme should provide for a means to develop workable water resource data definitions, to define and prioritize data requirements, and to formulate guidelines for collecting needed water resource data and making such information available to the users. The focus of this effort would be the acquisition of data that could be used by all land and water resource agencies and groups in Montana.

2. Data Assessment

This would involve an assessment of programs within the state that involve the collection and use of water resource information. The primary purpose of such an assessment would be to identify the primary agencies and groups which collect water resource information, and then determine the data elements being collected as well as areas with incomplete information or instances of fragmented data collection. The accessibility of extant data could be assessed by establishing which data are in machine-readable form and

the current facility for data interchange between water resource agencies and groups.

3. Data Management System

An evaluation of potential means to maximize data availability and enhance the collection of data would be the first element of this activity. In assessing the ways to improve data collection, consideration might be given to: the incorporation of new data into existing collection systems; the development of new data collection techniques; and improving ways to exchange data among user entities. In addition, mechanisms could be established for improving the capability to store and disseminate data. A computer-based data system might be an important means to improve data access and display.

In consideration of these activities there are three courses of action for resolving the present water data situation. To varying extents these options encompass the activities presented above. Each is discussed below and range from the development of a centralized water data base system to a sustaining of current level efforts.

1. Develop a Montana Water Data Base System

In essence, this would involve the creation of a central water resources data system that will support comprehensive water resource planning and administration in Montana. The goal of such a system would be to increase the availability and utility of water resource and related data. Other states have encountered water data problems which are similar to those found in Montana and accordingly have developed centralized water data systems. Examples may be found in Texas (Texas Water Oriented Data Bank), Iowa (Iowa Water Resources Data System), Nebraska (Nebraska Natural Resources Information System) and elsewhere. This activity is typically characterized by a centralized data system which incorporates all water resource information collected by various water resource agencies. An interagency steering committee directs the implementation and coordination of the program, while the day-to-day information storage and retrieval effort is handled by a separate data management unit. This latter group works with various natural resource agencies who are assigned responsibility for actual data acquisition, update and veracity. Given the normal volume of data comprising such systems, it is essential to have the data in machine-readable form, and to utilize computerized data storage and retrieval.

The common purpose of these data base systems is to provide a means to effectively serve the data storage, retrieval; presentation and limited computational needs of agencies and groups requiring water resource data and related information. In general, the major goals have been to:

a. Establish compatible standards and formats for collecting, storing and retrieving data and information.

b. Provide users with access to computational capabilities (e.g. statistical evaluations, graphic displays,) over and above basic storage and retrieval functions, and thereby provide the retrieved data and information in the most useful format. Capabilities are available in this manner from routinely provided services with no intent to develop such special purpose capabilities as water models or engineering calculations.

c. Provide users with knowledge of the availability, accuracy and source of information contained in the data bank.

d. Interface state data bank activities with those of other state and federal water data systems.

This approach offers considerable opportunity and is congruent with state water data systems in other parts of the Nation. Further, various Montana agencies are now evaluating the National Water Use Data System program of the U.S. Geological Survey and its potential for establishing an interagency water use data system in this state. If the state decides to participate in the NWUOS program, the initiation of a total water data sytem would be greatly facilitated; both are similar, the NWUDS program could serve as a

core for the broader, water data system and some matching funds could become available.

Success of this form of effort would be contingent upon a firm commitment from the various water resource agencies and groups in the state. It may also require Legislative action and support. Since this would be a long-term and continuing program, there should be an awareness of the need for regular and continued funding support.

2. Capitalize on Current or Proposed Federal Data Systems

In response to the sorts of problems outlined earlier in this report, the Federal government has initiated several water data base systems. Among them are the National Water Data Exchange (NAWDEX) and National Water Use Data System (NWUDS) programs of the U.S. Geological Survey, and the Water Quality Storage and Retrieval System (STORET) of the U.S. Environmental Protection Agency.

These efforts are promising and may serve as a form of solution to our current water data problems. State integration with these systems offers the opportunity for cost-efficiency and ready access to nationwide water resource data. However, although integration with these federal systems should be carefully examined, it may not be a panacea. Several of these systems have a narrower focus than may be desirable for meeting state needs (i.e. water quality, water use or water quantity). Further, the data may not have the

desired specificity since they are frequently used for regional water assessments and available in summary form only. There is also question whether raw data from Montana can be readily entered and extracted from these data base systems. Compatability with state computer systems is another issue that needs careful attention. Finally, since these programs are federally controlled, there may be problems with state participation in the setting of operational and data collection priorities.

3. Sustain Current Level Efforts

Past efforts to supply necessary water resource data have created a data base that is somewhat fragmented, deficient and lacks for current information. The general nature of the present data situation has been summarized in an earlier section of this report. It is unlikely that a continuation of past and present level efforts will provide any form of solution to the current problems.

Several state agencies have acknowledged the problems inherent with the current data acquisition, storage and retrieval system. Accordingly, they are initiating efforts to create their own internal computerized data bases. Although this form of endeavor is generally to be applauded, the problem of fragmentation still remains. Such fragmentation of data system development precludes the efficient use of skilled staff and obstructs efforts to provide for data compatibility among the water resource agencies. Further, this situation can lead to substantial duplication and inefficiency resulting from

unilateral development or acquisition of narrow purpose and large-scale software systems for use in numerous separate projects.